

15



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/755,717	01/05/2001	Lizhong Sun	AMAT/5538/CMP/CMP/RKK	5164
32588	7590	07/25/2005	EXAMINER	
APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050			VINH, LAN	
			ART UNIT	PAPER NUMBER
			1765	
DATE MAILED: 07/25/2005				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/755,717

Applicant(s)

SUN ET AL.

Examiner

Lan Vinh

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 27-76 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 27-76 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 61303.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

6

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claim 67 is rejected under 35 U.S.C. 102(e) as being anticipated by Kaisaki et al (US 6,194,317)

Kaisaki discloses a method for planarizing the upper surface of a semiconductor wafer. This method comprises the steps of : forming a substrate comprises a dielectric layer 16 with discrete features formed thereon (fig. 1), forming a barrier layer 13 of tantalum/second material layer conformally formed on the dielectric layer 16 (col 8, lines 63-65), forming a metal layer 14 of copper on the barrier layer 13 and filling the features (col 9, lines 1-2, fig. 1), polishing the substrate with a working liquid contains an oxidizer and a chelating agent (col 13, lines 38-59), benzotriazole (claimed corrosion inhibitor) (col 15, lines 1-2), water (col 15, lines 47-48), oxalic acid (claimed reducing agent) (col 14, lines 6-7) to remove the metal layer 14 and the barrier layer 13 during the polishing using the working solution (fig. 2)

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 27-32, 35-66, 68, 69, 70-76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaisaki et al (US 6,194,317) in view of Merchant et al (US 6,436,830)

Kaisaki discloses a method for planarizing the upper surface of a semiconductor wafer. This method comprises the step of : forming a barrier layer 13 of tantalum/second material layer (col 8, lines 63-65), forming a metal layer 14 of copper on the barrier layer 13 (col 9, lines 1-2), polishing to remove the second material/tantalum layer using a working liquid/composition applied to a polishing pad 42 (col 2, lines 47-50, col 10, lines 19-33, fig. 3). Fig. 1 and 2 of Kaisaki shows that more of the metal layer 14 is removed than the barrier layer 13 during the polishing using the working solution, which reads on the working liquid/composition is a barrier-layer-selective. The working liquid/composition comprises oxalic acid (claimed reducing agent) (col 14, lines 6-7), water (col 15, lines 47-48). Unlike the instant claimed inventions as per claims 27, 55, Kaisaki does not specifically disclose the working liquid /composition contains ions from the transitional metal although Kaisaki also discloses that the abrasive articles used in the polishing process remove transitional metal (copper) from the wafer process, the metal then react with the working liquid (col 12, lines 57-63).

However, Merchant, in a method for polishing semiconductor wafer, teaches using a slurry containing Cu ions (col 4, lines 24-25)

Hence, one skilled in the art would have found it obvious that Kaisaki step of polishing the copper would have produced copper ions in the working liquid/composition in view of Merchant teaching because Merchant states that the metal particles polished from the metal layer may form copper ions in the slurry (col 4, lines 23-25)

Regarding claims 28, 31, 35-38, 60, 71, 72, Kaisaki discloses using a buffer in the working liquid/composition to control the pH (col 14, lines 40-41), Kaisaki also discloses adjusting the pH range from acidic to near-neutral to basic (col 14, lines 49-50), which reads on the claimed pH range from 2-11. Regarding claims 29, 68, 69, Kaisaki discloses that the concentration of oxalic acid/reducing agent is 0.01-50% (col 14, lines 19-20) overlaps the claimed range of 0.05 weight percent. Regarding claims 39-42, 61, 73, Kaisaki discloses that the working liquid contains benzotriazole (claimed corrosion inhibitor) (col 15, lines 1-2). Regarding claims 43-45, 62, Kaisaki discloses that the working liquid contains a buffer of ammonium pentaborate (col 14, lines 40-56). Regarding claims 46-47, 58, 64, 74, 75, Kaisaki discloses the working liquid contains 0 weight percent of abrasive particles (col 15, lines 25-36). Regarding claims 48-52, Kaisaki discloses that the abrasive articles used in the polishing process remove transitional metal (copper) from the wafer process, the metal then react with the working liquid (col 12, lines 57-63). Regarding claims 53-54, 59, 65, 66, it would have been obvious to adjust the concentration of the working liquid/polishing composition through routine experimentation to achieve particular selectivity and removing rates.

Art Unit: 1765

Regarding claim 56, Kaisaki discloses that the working liquid contains an oxidizer and a chelating agent (col 13, lines 38-59)

5. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kaisaki et al (US 6,194,317) in view of Merchant et al (US 6,436,830) and further in view of Small et al (US 6,117,783)

Kaisaki as modified by Merchant has been described above in paragraph 4. Unlike the instant claimed invention as per claim 33, Kaisaki and Merchant do not disclose using hydroxylamine as a reducing agent.

However, Small discloses a CMP composition contains hydroxylamine (col 8, lines 9-10)

Hence, one skilled in the art would have found it obvious to modify Kaisaki and Merchant by using hydroxylamine in the polishing composition as per Small because Small states that hydroxylamine could be used for very controlled etch rates (col 8, lines 17-18)

6. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kaisaki et al (US 6,194,317) in view of Merchant et al (US 6,436,830) and further in view of Kondo et al (US 6,117,775)

Kaisaki as modified by Merchant has been described above in paragraph 4. Unlike the instant claimed invention as per claim 34, Kaisaki and Merchant do not disclose using glucose as a reducing agent.

However, Kondo discloses a CMP composition contains glucose (col 9, lines 7-8)

Hence, one skilled in the art would have found it obvious to modify Kaisaki and Merchant by using glucose in the polishing composition as per Kondo because Kondo states that glucose is a substance with an inhibitory effects for copper (col 9, lines 3-5)

Response to Arguments

7. Applicant's arguments filed 7/3/2003 have been fully considered but they are not persuasive.

Applicants argue that Kaisaki does not disclose and teaches away from polishing a substrate with a barrier-layer-selective composition comprising a reducing agent. This argument is unpersuasive because it does not commensurate with the scope of claim 67 since claim 67 does not require/recite "polishing a substrate with a barrier-layer-selective composition"

Applicants argue that Kaisaki is silent on utilizing complexing agent for polishing barrier layer material such as tantalum-comprising material. This argument is unpersuasive because as depicted in fig. 2 and col 14, lines 1-8 of Kaisaki, barrier layer 13 (tantalum material) is polished using a working liquid includes a complexing agent. Thus the examiner asserts that Kaisaki discloses utilizing complexing agent for polishing barrier layer material such as tantalum-comprising material

Applicants further argue that according to Kaisaski, complexing agent, such as oxalic acid, enhances the removal of copper, thus, under the teaching of Kaisaki, one would not utilize oxalic in a polishing composition selective to the removal of the barrier layer.

This argument is unpersuasive because while it is true that Kaisaki discloses that, complexing agent, such as oxalic acid, enhances the removal of copper, it is also true that Kaisaki teaching of polishing the barrier layer 13 using a working liquid includes a complexing agent such as oxalic acid/claimed reducing agent, certainly reads on the claimed limitation of "polishing the substrate with a composition comprising at least one reducing agent, and water to remove the barrier layer"

Applicants also argue that Kaisaki and Merchant either alone or in combination do not teach polishing the substrate with a barrier-layer-selective composition comprising at least one reducing agent to remove the exposed portions of the barrier layer. This argument does not commensurate with the scope of claims 27, 55 because both claims 27, 55 do not require "polishing the substrate with a barrier-layer-selective composition comprising at least one reducing agent to remove the exposed portions of the barrier layer"

8. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 571 272 1471. The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



LV
July 21, 2005